

Boron applications for improved cotton yields

- Boron is essential for all plant growth. It aids in the transfer of sugars and nutrients from leaves to fruit, and increases pollination and seed development.
- Cotton requires an available supply of boron – especially during the boll development stage – or boll shed may occur, which reduces yields.
- Multiple foliar sprays of *Solubor*® applied alone or with insecticides will ensure an adequate supply of boron during flowering and boll development.
- Preplant soil application of *Granubor*® 2 plus foliar sprays of *Solubor*® during the season are recommended for soils testing low in available boron.

The nutrient requirements of cotton are well known, and methods of fertilizer application and other cultural practices resulting in optimum production have been developed over the past 50 years. Boron (B) has been universally recognized as the most important micronutrient for cotton production. While B is essential for all stages of plant growth, an available supply is most important during flowering and boll development. This is especially true with today's fast-fruited, high-yielding varieties.

Cell wall strength, cell division, fruit and seed development, and sugar transport are plant functions related to B. Improved fiber quality (fineness, uniformity and strength) has been reported with B applications. While B requirements for optimum plant nutrition are low as compared with those of nitrogen (N), phosphorus (P) and potassium (K), the need for B is especially significant in flowering and boll development.

Deficiency symptoms

Because B is vital to flower formation and seed production during the boll development stage, a decrease in B supply during this critical stage can result in decreased yields. New flowers are distorted and there may be excessive shedding of squares. The sepals around the bolls also may fail to harden with low levels of available B.

Severe deficiencies of B which result in visual symptoms are rarely found in cotton producing regions where B has been applied in previous years. Visual symptoms include bushy plants with young leaves which are thicker and darker green. Leaves may be misshapen and distorted with short and brittle petioles.

Soil tests and plant analyses

Boron deficiencies may be suspected on coarse-textured soils where organic matter content is low, on recently limed soils, and where delayed maturity has been reported in cotton with recommended N rates. Soil testing and plant analyses are both helpful in assessing the potential B-supplying capacity of the soil and the current B status of the growing plant.

The critical level of hot-water-soluble B for cotton in most soils ranges from 0.2 to 1.0 ppm, depending on the soil pH, organic matter content and texture. Soils which are below the critical level generally will respond to applied B. The critical level of B in upper mature cotton leaves is about 15 ppm. Cotton plants with leaf B contents below the critical level should be sprayed one or more times with *Solubor*® after flower initiation and during boll development.

| Boron recommendations for cotton | |
|---|---|
| <p>Marginal soil test B and/or leaf analyses or dry weather during critical stages:</p> <p>Multiple foliar sprays at rates of 0.5 lbs. of <i>Solubor</i>®/acre (0.1 lbs. of B/acre) weekly for 3-5 times after flower initiation and during boll development. <i>Solubor</i>® can be applied alone or with insecticides to plants, or with N solutions to the soil.</p> | <p>Low soil test B and a prior history of B response:</p> <p>A soil application of 7 lbs. of <i>Granubor</i>® 2/acre (1 lb. of B/acre) broadcast and incorporated prior to planting, plus one or more foliar sprays at 0.5 lbs. of <i>Solubor</i>®/acre per spray applied during flowering and boll development stages.</p> |

Recommendations for cotton

Boron applications should be made every year for cotton because soluble B can be easily leached from the root zone, especially in sandy soils in high rainfall regions or with over-irrigation. The availability of B in acid soils generally decreases when these soils are limed, so B is recommended on freshly limed soils. Response to applied B generally is greatest when there are adequate supplies of the other nutrients, especially N.

Data below show increased cotton yields with soil and foliar applications of B in Tennessee. Foliar applications of *Solubor*® (providing 0.1 lbs. of B/acre per spray) resulted in a 9% increase over the check, and inclusion of K in the B foliar spray resulted in a 13% increase. Doubling the B foliar rate did not increase yields, but the B petiole concentration was significantly increased. Cotton lint yields also were increased by a preplant soil application of B.

| Response of cotton to soil and foliar boron and potassium applications | | | | |
|--|--------|----------------------|--------------------------|-------------------|
| B applied, lbs./acre | | K applied, foliar | lint yield, lbs./acre | Petiole B, ppm |
| soil | foliar | | | |
| — | — | — | 976 d | 52 c |
| 0.5 | — | — | 1,039 bc | 54 c |
| — | 0.4 | — | 1,050 ab | 65 c |
| — | 0.8 | — | 991 cd | 93 a |
| — | 0.4 | 14.6 | 1,105 a | 74 b |

Values in columns followed by the same letter are not significantly different at a probability level of 0.05.
D. D. Howard, C.O. Gwathmey and C. E. Sams, Agronomy Journal 90:740-746, 1998.